

Chapter 32 Problem 55 †

**Given**

$$B = 15 \text{ T}$$

$$N = 5000 \text{ turns}$$

$$l = 75 \text{ cm} = 0.75 \text{ m}$$

**Solution**

Find the current in the solenoid needed to reach the critical field of the superconductor.

From Ampere's law the magnetic field in a solenoid is

$$B = \frac{\mu_0 N I}{l}$$

Solving for the current gives

$$I = \frac{l B}{\mu_0 N}$$

Substitute in the appropriate values gives

$$I = \frac{(0.75 \text{ m})(15 \text{ T})}{(4\pi \times 10^{-7} \text{ N/A}^2)(5000)} = 1790 \text{ A}$$

$$I = 1.8 \text{ kA}$$

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†Problem from Essential University Physics, Wolfson